OSWER Innovations Pilot

Design for Disassembly in the Built Environment

The Office of Solid Waste and Emergency Response (OSWER) initiated a series of innovative pilots to test new ideas and strategies for environmental and public health protection. A small amount of money is set aside to fund creative proposals. The creative projects test approaches to waste minimization, energy recovery, recycling, land revitalization, and homeland security that may be replicated across various sectors, industries, communities, and regions. We hope these pilots will pave the way for programmatic and policy recommendations by demonstrating the environmental and economic benefits of creative, innovative approaches to the difficult environmental challenges we face today.

BACKGROUND

The U.S. EPA estimates that American companies generate 136 million tons of building-related construction and demolition (C&D) waste per year, of which 92 percent is from renovation and demolition. If current housing replacement rates remain constant, approximately 41 million housing units will be demolished in the next 50 years, resulting in the creation of 3.3 billion tons of material debris. The complexity of building systems, quality and types of materials, and connecting devices used in post-1950s buildings make the recovery of materials for reuse and recycling extremely difficult. Buildings built after 1950, compared to pre-1950, often use a lesser percentage of wood; engineered lumber and composite materials; pneumatic nails instead of hand-driven nails; drywall in lieu of wood lathe and plaster; and plastics for siding, plumbing pipe, and other materials.

The housing to be designed and built from 2000 to 2050, in large part, will have materials that are infeasible for reuse and recycling and will be technically and economically prohibitive to adapt and disassemble with maximum materials recovery. If the next cycle of housing designed from 2000 to 2050 allowed for recovery of just 25% of their materials debris, these materials would be sufficient to build about two-thirds of the housing units built during the next 50 years. In order to address these environmental impacts, housing must be designed for near zero-waste and "closed-loop" materials management through design for disassembly of systems, components, and assemblies.

PILOT APPROACH

The Community Housing Resource Center (CHRC), working in conjunction with the Hamer Center for Community Design Assistance at Pennsylvania State University and EPA Region 4, will create and disseminate information that encompasses the "cradle-to-cradle" design of residential buildings. The project will accomplish its goals through four major tasks: 1) convene an experts group to formulate design for disassembly (DfD) principles and design details; 2) design/build a case study house using DfD; 3) document all research, design, and case study results; and 4) promote the incorporation of these principles into "green" housing design in the U.S.

The creation of this DfD methodology may extend the lives of buildings, achieving even greater resource efficiency by its facilitation of adaptive reuse. The project team also will work to convene outreach and educational discussions with the American Institute of Architects' Committee on the Environment, the Used Building Materials Association annual conference, and the U.S. Green Building Council annual conference.

INNOVATION

This innovative project is intended to address the overwhelming un-sustainability of U.S. housing due to a lack of DfD principles being incorporated into the built environment. DfD is an emerging concept that borrows from the field of design for disassembly in the consumer products industry. Its overall goal is to reduce pollution impacts and increase resource and economic efficiency in the adaptation and eventual removal of buildings, and recovery of components and materials for reuse, re-manufacturing, and recycling.

BENEFITS

The smallest reductions in materials consumption and waste creation by the construction industry will have large benefits because of its scale and its impacts on the natural environment. In addition to decreasing a major solid waste stream, use of DfD principles will cut down on the use of raw materials, reduce energy use, and significantly cut carbon dioxide emissions resulting from manufacturing, transportation, and construction activities. By designing buildings for disassembly, they also will be inherently more adaptable and longer-lived, and the waste generated during the repair and replacement of their parts, renovations, additions or subtractions, and eventual deconstruction will be dramatically reduced. Design for disassembly also is the first step in designing buildings to allow building product stewardship.

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For additional information, visit the EPA OSWER Innovations web site at: www.epa.gov/oswer/iwg.

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